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TAXONOMIC STATUS OF THE TURTLE, *CHRYSEMYS PICTA*, IN THE NORTHERN PENINSULA OF MICHIGAN

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The proper subspecific designation of the painted turtles, *Chrysemys picta*, populating Michigan's northern peninsula has long been questioned. Conant (1975) showed two subspecies, *C. p. bellii* and *C. p. marginata*, occurring there and forming an intergrade population. This was probably based on Ernst (1971) who theorized this area to represent a zone of intergradation between these two subspecies. However, until now no study of these turtles from northern Michigan has been reported.

Methods and Materials

Painted turtles from 12 countries in the northern peninsula of Michigan were examined (Table 1, Fig. 1). Specimens were borrowed from museums, or collected, examined, photographed and released alive by the junior author.

Chrysemys p. bellii has alternating vertebral and pleural seams; a reticulate pattern of yellow or red lines on the carapace; a large, dark plastral figure, which branches out along the seams and occupies most of the plastral surface; and narrow seam borders on the carapacial scutes which are usually yellow or red (in approximately 80% of specimens examined). *Chrysemys p. marginata* has alternating vertebral and pleural seams; no reticulate pattern on the carapace; a dark plastral figure which is usually no more than half the width of the plastron and does not extend along the scute seams; and usually (approximately 75% of specimens examined) narrow olive seam borders on the carapacial scutes.

In order to eliminate variation owing to intergradation, we based our subspecific distinctions on 71 *C. p. bellii* from Murray County, Minnesota (Ernst and Ernst, 1972) and 252 *C. p. marginata* from Tennessee, Kentucky and Pennsylvania (Ernst, 1970; Ernst and Ernst, 1971). These samples are included in Table 1.

The degree of disalignment of the carapacial seams was determined as follows. When the seams between the vertebral and pleural scutes lie in the same transverse line, they are considered 0% disaligned; if the seams alternate exactly they are 100% disaligned. The base point for measuring is the inner end of the seam between pleurals 2 and 3. The imaginary line from the base point forward and parallel to pleurals 1 and 2 is measured and denoted 1a on the left side and 2a on the right. The part of this same imaginary line starting at the base point and extending forward to the point

Fig. 1. Localities of *Chrysemys picta* examined. See Table 1 for locality names and number of specimens. Solid circles = *Chrysemys p. bellii* populations; hollow circles = *Chrysemys p. marginata* populations; and stars = intergrade *C. p. bellii* × *p. marginata* populations.

opposite the end of the seam between vertbrals 2 and 3 is measured and denoted 1b in the left side and 2b on the right. The average percent disalignment is then calculated as 1b/1a + 2b/2a (Hartman, 1958).

The border of the anterior seam of pleural 2 was measured at its widest point and its color noted.

All measurements were taken with dial calipers accurate to 0.1 mm.

Results and Discussion

Mensural and meristic data of the characteristics separating *C. p. bellii* and *C. p. marginata* are given by counties in Table 1 along with similar data from pure populations of these subspecies.

The percentage of disalignment of the carapacial seams indicated that the populations, except Ontonagon County (2), more closely resembled *C. p. bellii*, although each included turtles with disalignment within the range of *C. p. marginata*. The plastral patterns showed much variation. The number of turtles with the *bellii*-type pattern decreased from west to east, while those with intergrade or *marginata*-type patterns increased. The occurrence of a reticulate carapacial pattern, characteristic of *C. p. bellii*, decreased from west to east. The color of the carapacial seam borders and width of the second pleural seam were variable throughout the region.

Table 1. Statistical data by localities for characteristics studied. All measurements in mm. (b = *bellii*, m = *marginata*, i = *bellii* × *marginata* intergrade; y = yellow, r = red, o = olive).

Map No.	Locality	N	% carapacial seam disalignment			% plastral pattern			% reticulate carapacial pattern	% pleural seam color			width 2nd pleural seam		
			$\bar{x}$	(± S.D.)	Range	b	i	m		y	r	o	$\bar{x}$	(± S.D.)	Range
1.	Gogebic Co.	2	91.1	(3.6)	88.5–93.6	50	50	—	100	50	—	50	3.4	—	—
2.	Ontonagon Co.	6	83.7	(12.4)	59.9–93.2	100	—	—	100	33	50	17	1.9	(0.8)	0.9–3.1
3.	Houghton Co.	1	88.2	—	—	100	—	—	100	100	—	—	2.6	—	—
4.	Keweenaw Co.	5	91.3	(5.4)	83.5–96.8	20	80	—	80	100	—	—	2.7	(0.7)	1.8–3.7
5.	Marquette Co.	31	91.9	(12.6)	71.4–110.0	31	45	24	38	47	26	26	1.7	(0.9)	0.8–2.8
6.	Dickinson Co.	2	88.2	(8.1)	82.5–94.0	—	50	50	0	100	—	—	2.0	(1.8)	0.7–3.3
7.	Menominee Co.	3	87.2	(11.3)	79.0–100.0	—	67	33	0	33	67	—	2.1	(1.2)	1.3–3.5
8.	Alger Co.	39	88.1	(4.7)	82.8–92.0	—	67	33	33	100	—	—	1.5	(0.3)	1.2–1.7
9.	Schoolcraft Co.	10	89.0	(8.7)	69.9–99.8	10	40	50	10	70	20	10	2.5	(0.8)	1.1–3.8
10.	Luce Co.	3	89.5	(12.1)	76.0–99.4	—	—	100	0	67	33	—	1.4	(0.6)	0.8–1.9
11.	Mackinac Co.	6	86.8	(9.8)	72.0–90.0	—	33	67	0	19	—	81	1.8	(0.8)	1.0–2.3
12.	Chippewa Co.	10	87.2	(5.2)	79.0–94.8	—	10	90	0	60	20	20	2.3	(1.0)	0.8–3.8
	C. p. bellii (Minnesota)	71	93.7	(8.1)	79.0–108.7	100	—	—	98.6	75	5	20	1.9	(0.9)	0.9–5.3
	C. p. marginata (Tenn., Ky., Pa.)	252	82.6	(8.0)	25.8–107.4	—	—	89	0	22	3	75	1.7	(0.5)	0.6–4.0

The only populations that could be assigned to *C. p. bellii* were those of Ontonagon and Houghton counties (localities 2 and 3) and, since few specimens were examined from each, they may later prove to include intergrades. Similarly only localities 10 (Luce County) and 12 (Chippewa County) appeared to be *C. p. marginata.* All other counties (4–9, 11) contained intergrade populations (Fig. 1). The study area contains three major drainage systems: Lake Superior; Lake Michigan; Lake Huron. The Lake Superior drainage contained localities, 2, 3, 4, 8, 10 and parts of 5 and 12 (specimens examined from Maraquette County (5) and Chippewa County (12) were from several localities in each and were lumped for reporting ease). Painted turtles in the western parts of this drainage were *C. p. bellii*, intergrades appeared in the central parts, and, in the east, specimens appeared to be *C. p. marginata.* The Lake Michigan drainage contained localities 1, 6, 7, 9, 11, and part of 5. All specimens from this drainage were intergrades. The Lake Huron drainage covered only part of locality 12 and these turtles were *C. p. marginata.*

Probably a multiple invasion of the northern peninsula occurred after the final retreat of the Pleistocene glaciers made habitats once more suitable. *Chrysemys p. bellii* invaded the area from the west (northern Wisconsin and Minnesota); while *C. p. marginata* probably entered by three routes; the east coast of Wisconsin, the lower peninsula of Michigan by island hopping across the Straits of Mackinac, and from Ontario in the east. Later gene exchange between the two subspecies formed the present zone of intergradation in the center of the northern peninsula.

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